REMARKS

Reconsideration and allowance in view of the foregoing amendments and the following remarks are respectfully requested. Claims 1-14 were pending. This amendment cancels claims 1-14 and replaces them with claims 15-28. Accordingly, claims 15-28 are pending.

Claims 1-14 are rejected under 35 U.S.C. §112, second paragraph for a variety of reasons set forth in the Office Action. It is believed that the replacement of claims 1-14 with new claims 15-28 has obviated these rejections.

Claims 1-3, 6, 7, 9 and 10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Mainguet (6,289,114) and Jensen (4,784,484). Claim 11 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Mainguet '114 and Jensen '484 in view of Upton (5,864,296). Claims 12-14 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mainguet '114, Jensen '484, Upton '296 and Itsumi et al. (5,559,504). Finally, claims 4, 5, and 8 are rejected under 35 U.S.C. §103(a) as being unpatentable over Mainguet '114, and Jensen '484 in view of Ruell (4,394,773). Claims 1-14 have been replaced by claims 15-28. To the extent that the prior art rejections articulated against the formerly pending claims may be applied to the newly submitted claims, the newly submitted claims are believed to be allowable over the art of record for the following reasons.

Independent claim 15 recites a method for sensing a fingerprint comprising generating a plurality of images at given intervals of time with a one-dimensional sensor array as the fingerprint is moved relative to the sensor array, determining which of the plurality of images overlap or partially overlap, disregarding the overlapping images, and constructing a two-dimensional image of the fingerprint surface from only non overlapping images. Support for this claim can be found, e.g., at page 5, lines 25-35, which describes a process of adjusting the number of measured lines used in generating the image of the fingerprint surface whereby redundant data is discarded depending on the speed of movement of the finger and the frequency of measurements.

The methodology recited in claim 15 is not suggested or described in any of the art of record. Mainguet '114 describes a methodology for reconstructing a two-dimensional fingerprint image from a plurality of partial images generated as a fingerprint surface is moved over a sensor array.

Mainguet '114 specifically describes constructing an image from overlapping partial images. (See Figures 5, 11, and 12, and column 5, lines 33-39).

New claim 16 depends from claim 15 and recites that measuring is performed at each of a plurality of equally spaced measuring points arranged in at least one line corresponding to the essentially one-dimensional array. Support for this claim can be found, e.g., at Figure 1A. Claim 16 is believed to be allowable as being dependent upon an allowable base claim.

New claim 17 depends from claim 15 and recites that measuring is performed simultaneously at each of a plurality of equally spaced measuring points arranged in at least two generally parallel lines spaced apart by a distance different from the distance separating the measuring points, wherein the measuring points of one line are shifted with respect to the measuring points of the next line and wherein said generating is performed from measurements performed at one of the at least two lines. Support for claim 17 can be found in Figure 1B and the associated description beginning at page 4, line 15 of the specification. Claim 17 is believed to be allowable as being dependent upon an allowable base claim. In addition, the methodology recited in claim 17 is neither described nor suggested in any of the art of record.

New claim 18 is an independent claim reciting a method of sensing a fingerprint comprising applying a varying voltage to a finger positioned over an electrode and measuring the capacitance or impedance between the electrode and a capacitive sensor array through a fingerprint surface positioned over the both electrode and the capacitive sensor array, wherein the capacitive sensor array is separately disposed from the electrode, and the capacitive sensor is adapted to detect variations in capacitance or impedance across the array caused by structural features of a portion of the fingerprint surface positioned over the array. Support for claim 18 can be found, for example, at Figure 5 and page 3, lines 29-33 and page 6, line 14 *et seq.*

Essentially, claim 18 recites a methodology for applying the varying voltage to a fingerprint and measuring the impedance or capacitance between the electrode and the sensor and detecting variations in the fingerprint surface for the purpose of fingerprint identification. Jensen '404 describes a methodology whereby a varying voltage is applied across wires C and D to measure skin resistance and to determine the speed of movement of the finger based on the times in which the finger loses contact with wires C and D, respectively, in the direction of movement. (See column

2, lines 50-58 and column 3, lines 41-57). There is no teaching or suggestion of measuring variations in capacitance across the fingerprint surface to detect corresponding variations in structural features of the fingerprint surface.

In the rejections of former claims 12-14, Itsumi '504 is cited for its alleged disclosure of a pressure sensor that measures the change in resistance between electrodes when a finger touches a pressure sensitive sheet. Itsumi '504 describes a sensor comprising a plurality of linear electrodes arranged in parallel and spaced apart in a direction corresponding to a longitudinal direction of the finger. When a stationary finger is placed on the plurality of electrodes, the resistance at each of the electrodes varies in the finger-longitudinal direction thereby defining a one-dimensional resistance profile. (See Figures 2A, 2B, and 4, and column 6, lines 12-67). Itsumi does not describe the methodology that includes applying a varying voltage, nor does it describe measuring capacitance or impedance with a structure that includes a capacitive sensor array separately disposed from the voltage-applying electrode.

Claim 19 depends from claim 18 and is believed to be allowable as being dependent from an allowable base claim.

Claim 20, depending from claim 18, and independent claim 21 are identical. Claim 20 is believed to be allowable as being dependent upon allowable base claim 18. In addition, claim 20, and independent claim 21, are believed to be allowable for the following independent reasons. Claims 20 and 21 recite a method for sensing a fingerprint which comprises generating a plurality of images of different portions of the fingerprint surface by measuring structural features of the fingerprint at given intervals of time, ascertaining the speed of movement of the fingerprint surface by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint surface from one of the two sensing elements to the other and using the ascertained speed to determine the required relative positioning of at least a portion of a plurality of images to form a two-dimensional image of the fingerprint surface. Support for these claims can be found at page 4, line 7 *et seq.*

The subject matter of claims 20 and 21 is not disclosed or suggested in any of the prior art of record. In particular, neither Jensen '404 or Mainguet '114 disclose a procedure for determining

the speed from the distance between two sensors and the time lapse between the passage of identical structural features of the fingerprint surface past the two sensors. Mainguet '114 describes a complicated procedure for reconstructing partial images (see column 7, lines 50 *et seq.*) and makes only a passing reference to needing to know the speed of the finger with respect to the sensor in order to obtain an undistorted reconstitution of the complete image of the fingerprint. The only particular method Mainguet describes for knowing the speed is to move the sensor at a fixed speed relative to the stationary finger. (See column 5, lines 3-7). Jensen describes an optical fingerprint scanning apparatus in which the speed of the finger is monitored "for synchronizing or scaling the scanning" of the fingerprint (see column 3, lines 24-26) whereby the velocity is determined by registering the points of time where the finger loses contact with the second and fourth wire, respectively, of a speed measuring means. (See Figure 1 and column 2, lines 50-58). There is no disclosure of using the speed to determine the required relative positioning of at least a portion of a plurality of images and there is no disclosure of determining the speed by measuring the time laps between the passage of identical structural features of the fingerprint surface from one sensor to another sensor.

Claim 22 depends from claim 21 and recites that one of the two sensing elements of the speed sensing pair comprises a sensor in the sensor array. In other words, one of the speed sensing elements is also an image generating sensor element. Support for this claim can be found at page 5, lines 19-24. No such structure or methodology is suggested in the prior art of record. The speed measuring means 5 of Jensen '484 is not part of the optical sensor comprising the scanning line 4.

Claim 23 depends from claim 21 and recites that each of the two sensing elements is disposed in a different one of two groups of sensing elements arranged in two spaced-apart, generally parallel lines of sensing elements. Claim 23 is believed to be allowable as being dependent from an allowable base claim.

New claim 24 is an independent claim combining the features of independent claims 15, 18 and 21. In general, claim 24 recites a methodology for sensing a fingerprint comprising applying a varying voltage to a finger, measuring the capacitance or impedance of the fingerprint surface to detect variations in capacitance or impedance across the array caused by structural features of the fingerprint, generating a plurality of images as the fingerprint surface is moved relative to the sensor

array, ascertaining the speed of movement of the fingerprint surface by sensing structural features of the fingerprint surface moved over two sensing elements spaced apart by a predetermined distance and determining the speed from the predetermined distance and a time lapse between passage of identical structural features of the fingerprint surface over the two sensing elements, using the ascertained speed to identify overlapping images, disregarding the overlapping images, and constructing a two-dimensional image from only non-overlapping images. Claim 24 is believed to be allowable for the reasons set forth above with respect to claims 15, 18 and 21.

Claim 25 is an independent claim directed to an apparatus for sensing a fingerprint including an essentially one-dimensional sensor array and associated circuitry constructed and arranged to generate a plurality of images of different portions of a fingerprint surface as the fingerprint surface is moved relative to said sensor array, at least one pair of sensing elements spaced apart by a predetermined distance and constructed and arranged to sense structural features of the fingerprint surface and to determine a time lapse between the passage of identical structural features over one sensing element and then the other to determine the speed of movement of the fingerprint surface, means for determining which of the plurality of images overlap and to disregard the overlapping images, and means for constructing a two-dimensional image from only non-overlapping images. Claims 25 is believed to be allowable for the reasons set forth above with respect to claims 15 and 21.

Claim 26 depends from claim 25 and further recites an electrode and associated circuitry constructed and arranged to apply a varying voltage to a finger positioned over the electrode, wherein the sensor array is constructed and arranged to measure the capacitance or impedance between the electrode and the sensor array through a fingerprint surface positioned over both the electrode and the sensor array and to detect variations in capacitance or impedance across the array caused by structural features of a portion of the fingerprint surface positioned over the array. Claim 26 is believed to be allowable for the reasons set forth above with respect to claim 18.

Claim 27 depends from claim 25 and recites that one of the two sensing elements of each pair comprises a sensor in the sensor array. Claim 27 is believed to be allowable for the reasons set forth above with respect to claim 22.

Claim 28 depends from claim 25 and recites that each of the two sensing elements of each pair is disposed in a different one of two groups of sensing elements arranged in two spaced-apart, generally parallel lines of sensing elements. Claim 28 is believed to be allowable as being dependent upon allowable base claim 25.

All rejections and objections having been addressed, it is respectfully submitted that the present application is now in condition for allowance and a notice to that effect is earnestly requested.

RESPECTFULLY SUBMITTED,					
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Attachments: Marked-Up Copies of Amendments

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Amended Specification Pages: Version with markings to show changes made

Page 2, fifth full paragraph:

The present invention provides a method and an apparatus for the measuring of structures in a fingerprint or the like, for example using one of the techniques described above, characterized as stated in the disclosed claims [1 and 6].

Page 4, first full paragraph:

The shown embodiment having equally distanced sensors is preferred, but other solutions, e.g. comprising groups of sensors for measuring certain parts of the finger print, [is] <u>are</u> also possible.

Page 4, fourth full paragraph:

Although the lines shown in the drawings comprise equally spaced sensors the shifted, second, third etc. lines may comprise single or groups of sensors, increasing the resolution in certain parts of the finger print, and/or measuring differences in velocity of different parts of the finger print, in case the movements [is] <u>are</u> uneven. Also, the second, third etc. lines may have an angle in relation to the first line of sensors.

Page 5 to page 6, fourth paragraph:

Figure 3 shows a simplified view of the apparatus according to the invention comprising conductors [7] from the sensors 1 to an amplifier and multiplexer 8. The signal is then digitized in an A/D-converter 9 before the digital signal is sent to a computer 10 comprising any available computer program being able to analyse the signal.

Page 6, first, second, and third full paragraphs:

A cross section of a more realistic embodiment is shown in figure 4, in which one end of <u>each of the</u> closely spaced conductors 11 [represent] <u>represents</u> the sensors, and the other end of these conductors [are] <u>is</u> connected to a microchip <u>15</u>. The conductors 11 may be a part of a multi layer

printed circuit board moulded in epoxy, producing two or more lines of sensors. Each sensor 1 would be about 35x50 μm. If the sensors in each line [is] is mounted with distance between the centres of 150 μm, the resolution with three shifted lines will be 50 μm.

Figure 5 shows an embodiment of the invention where an external time varying, e.g. oscillating or pulsating, voltage 12 is applied to the finger through the conducting area 14 on the side of the sensor area. Planes at a constant voltage 13 are placed close to and parallel to the [conductors 11] lines of sensors 1. This reduces cross-talk and noise from external sources, and improves contrast in the image generated from the measurements. This may be implemented by using a multilayer printed circuit board, where one or more of the conducting layers are at a constant voltage. An insulating layer (not shown) preferably covers the conductors 1,11 and shielding planes 13. The conducting area 14 may also be covered by an insulating layer, but this would decrease the signal strength. For better performance the oscillating voltage 12 may be applied to both sides of the sensor surface. The oscillating voltage may, as mentioned above, be a pulse train, or a sinus.

In the one embodiment, a sinus of 100kHz is applied to the conducting area 14, and each of the conductors 11 is terminated by a resistance, and the signal is amplified and [feed] fed to a demodulator, multiplexer and analogue-to-digital converter. One advantage of this embodiment is that there [are] is essentially no signal on the conductors 11 in the sensor area when no finger is present, thus reducing problems with offset voltages varying with time and drift in the electronics.